

**LG 1311**  
**10MHz FUNCTION GENERATOR**

**CALIBRATION PROCEDURE &  
SCHEMATICS**

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**NOTE**

**These instructions are for use by qualified personnel only. To avoid electrical shock, do no perform any servicing other than that contained in the procedure unless you are qualified to do so.**  
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**Leader Instruments Corp.**

## **LG 1311 Calibration Procedure**

### **Equipment Needed:**

- Digital Multimeter, 0.1% accuracy, 3 1/2 digits
- Oscilloscope, 2 channel, 2 mV / div, 100 MHz, Time & Voltage, cursor with readouts
- Frequency counter, 5 ppm or better accuracy
- Distortion meter

Allow the LG 1311 at least a 30-minute warm up prior to performing any tests or procedures.

The nominal output impedance for the LG 1311 is 50-ohms. For units with the 75-ohm option, substitute 75-ohm termination and cabling in any procedure calling for 50-ohms.

## Specifications

Oscillation Frequency	0.01 Hz to 10 MHz
Setting Range	9 ranges
Frequency dial setting accuracy	Within $\pm 5\%$ of full scale, xl00k or low range Within $\pm 10\%$ of full scale, x1M range
Output Waveform	Sine wave, triangular wave, and square wave
Sine Wave	
Output Flatness	Within $\pm 3\%$ , xl00k or low range Within $\pm 10\%$ , x1M range into 50 ohms
Distortion Factor	Less than 0.5% for 10 Hz to 50 kHz Less than 1.0% for 50 kHz to 100 kHz (xl0k range)
Triangular Wave Symmetry	50:50, less than 1% for 10 Hz to 100 kHz
Square Wave	
Rise Time	Less than 25 ns into 50 ohms
Symmetry	50:50, less than 1% for 10 Hz to 100 kHz
Symmetry Function	
Duty Ratio Variation	20:80 to 80:20, xl00k or low range
Output Amplitude	20 Vp-p $\pm 10\%$ at maximum into open circuit 10 Vp-p $\pm 10\%$ at maximum into 50 ohm
Attenuator	
Fixed Attenuator	10 dB, 20 dB, and 40 dB
Variable Attenuator	Continuously variable at 1/10 or more
Output Impedance	50 ohm $\pm 5\%$

DC Offset	$\pm 10$ V at maximum, with 0dB fixed attenuator and into open circuit
Amplitude Modulation (MOD IN)	Amplitude Modulation
Signal Source	External input
Optimum Input Voltage	0.5 V <sub>rms</sub>
Input Impedance	10kohm
Modulation Factor	0 to 95% or more
Frequency Characteristic	10 Hz to 100kHz, within -3dB (1 kHz ref.)
<u>/!</u> Maximum Input Voltage	$\pm 15$ V
Trigger Mode (TRIG IN)	
Signal Source	External input (0/5 V, 100 kHz >)
Input Impedance	More than 100 kohm
Trigger Level	Settable with the TRIGGER START LEVEL control knob
Output signal	Single-cycle signal output using input signal
Operating Range	0.01 Hz to 1 MHz
Gate Mode (TRIG IN)	
Signal Source	External input (0/5 V, 100 kHz >)
Input Impedance	More than 100 kohm
Trigger Level	Settable with the TRIGGER START LEVEL control knob
Operating Range	0.01 Hz to 1 MHz
Burst Mode	
Signal Source	1 ms to 10 s, internal source
Burst Width	Settable with the SYMMETRY control knob
Operating Range	0.01 Hz to 1 MHz
Frequency Sweep (SWEEP)	Linear sweep/Logarithmic sweep
Sweep Time	1 ms to 100 ms/0.1 s to 10 s, 2 ranges
Frequency Sweep Ratio	10:1 to 100:1 or more
Sweep Output (SWEEP OUT)	Sweep signal (sawtooth wave)
Output Voltage	-7 V to 0 V, within $\pm 10\%$

External Frequency Control (VCG IN)	
Control Voltage	-5 V to 0 V
/!\ Maximum Input Voltage	±10 V
Synchronous Output (SYNC OUT)	
	Square wave output in synchronization with output signal
Output Voltage	0/5 V into open circuit
Output Current	10 mA or more
Frequency Setting Voltage Output (GCV OUT)	
Output Voltage	Voltage output according to setting frequency 0 to 5 V
Environmental Conditions	
Spec-guaranteed	Temperature: 15 to 35 degrees C Humidity: 10 to 85% RH
Power Requirements	
	100/115/230 V AC±10% (250 V maximum), 50/60 Hz
Power Consumption	
	35 VA max
Safety	
	EN 61010-1:1993 + IEC 1010-1 AM.2:1995.
EMC	
	EN 55011:1991, Group 1, Class B. EN 50082-1:1992
Dimensions	
	300 (W) x 100 (H) x 300 (D) mm
Weight	
	4.2 kg
Accessories	
Supplied Accessories	Power cord..... 1 Spare fuse..... 1 Instruction manual..... 1
Optional Accessory	50ohm terminator LT-2049

## 1. Power Supply:

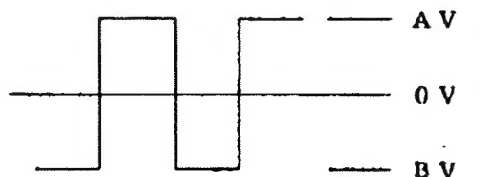
Connect the DMM to the indicated test point below, and make the corresponding adjustment for the indicated voltage.

TP300, T-5796	+17 V	VR300
TP302, T-5796	-17V within 0.4 of above	Check
TP701, T-5795	+17	Check
TP702, T-5795	-17	Check

## 2. Level Adjustment

Settings: **Mode:** CW, **Function:** Sine, **AM Mod:** Off, **DC Offset:** Off, **Amplitude:** Maximum, **Range:** 100, **Dial:** 10, **Symmetry:** Off

Connect the oscilloscope to TP101 T-5795 and adjust VR104 *LEVEL ADJ* so the positive peak is equal to the negative peak.



## 3. Symmetry Adjustment

Settings: **Mode:** CW, **Function:** Sine, **AM Mod:** Off, **DC Offset:** Off, **Amplitude:** Maximum, **Range:** 100, **Dial:** 10, **Symmetry:** Off

Connect the DMM between TP4 – TP5 T-5795 and note the voltage to 1 mV. Connect the DMM between TP2 – TP3 T-5795 and adjust VR3 *SYM* for  $V_{TP2-TP3}$  equals  $V_{TP4-TP5}$ .

## 4. Bias Adjustment

Settings: **Mode:** CW, **Function:** Sine, **AM Mod:** Off, **DC Offset:** Off, **Amplitude:** Maximum, **Range:** 100, **Dial:** 10, **Symmetry:** Off

Connect the LG 1311 to the oscilloscope via 50-ohm cable and terminator. Adjust the oscilloscope to display several cycles of the LG 1311 output. Adjust VR6 *BIAS* T-5795 to the approximate midpoint between where the oscillations stop and the extreme other end of the potentiometer. Turn **Symmetry** on and check for stable oscillation with the *Symmetry* control set to both extremes.

## 5. Offset Adjustment

Settings: **Mode:** CW, **Function:** Sine, **AM Mod:** Off, **DC Offset:** Off, **Amplitude:** Maximum, **Range:** 100, **Dial:** fully clockwise (minimum), **Symmetry:** Off

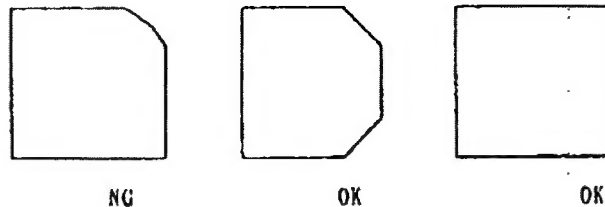
Connect the DMM between TP1 T-5795 and ground. Adjust VR2 *OFFSET* T-5795 for -20 mV DC on TP1.

## 6. Sweep / Bandwidth Adjustment

Settings: **Mode:** Sweep, **Function:** Sine, **AM Mod:** Off, **DC Offset:** Off, **Amplitude:** Maximum, **Range:** 1M, **Dial:** 10, **Symmetry:** Off, **Sweep/Burst Time:** 1-100 ms, **Sweep/Burst Variable:** fully counter clockwise, **Sweep/Burst Symmetry:** fully counter clockwise, **Sweep/Burst:** Lin, **Sweep/Burst Frequency:** fully counter clockwise.

Connect the LG 1311 to the oscilloscope via 50-ohm cable and terminator. Set the oscilloscope to about 0.1 msec/div and adjust the oscilloscope Trigger and Holdoff levels to display the end of the LG 1311 sweep.

Adjust VR102 *HF ADJ* T-5795 for best flatness and a symmetrical display as shown.



## 7. 1 kHz Adjustment

Settings: **Mode:** CW, **Function:** Sine, **AM Mod:** Off, **DC Offset:** Off, **Amplitude:** Maximum, **Range:** 100, **Dial:** 10, **Symmetry:** Off

Connect the LG 1311 to the frequency counter via 50-ohm cable and terminator. Adjust VR1 *1kHz ADJ* T-5795 for a frequency of 1000 Hz.

## 8. +/- Symmetry Adjustment

Settings: **Mode:** CW, **Function:** Sine, **AM Mod:** Off, **DC Offset:** Off, **Amplitude:** Maximum, **Range:** 100, **Dial:** 10, **Symmetry:** Off

- Connect the LG 1311 to the oscilloscope via 50-ohm cable and terminator. Connect the Channel-1 output of the oscilloscope (or the LG 1311 SYNC OUT) to the frequency counter.
- Adjust VR4 *+SYM* and VR5 *-SYM* T-5795 for a 50% duty cycle on the displayed sine wave.  $T_{\text{First Half}}$  is equal to  $T_{\text{Last Half}}$ .
- Re-adjust VR1 *1kHz ADJ* as in step 7 as necessary.
- Check that the frequency with the Dial at 1 is one tenth the frequency measured with the Dial at 10.
- Repeat Step 8 as required.

## 9. 10 Hz Adjustment

Settings: **Mode:** CW, **Function:** Sine, **AM Mod:** Off, **DC Offset:** Off, **Amplitude:** Maximum, **Range:** 1, **Dial:** 10, **Symmetry:** Off

Connect the LG 1311 to the frequency counter via 50-ohm cable and terminator. Adjust VR8 *10 Hz ADJ* T-5795 for a frequency of 10.0 Hz.


## 10. 1 MHz Adjustment

Settings: **Mode:** CW, **Function:** Sine, **AM Mod:** Off, **DC Offset:** Off, **Amplitude:** Maximum, **Range:** 100k, **Dial:** 10, **Symmetry:** Off

Connect the LG 1311 to the frequency counter via 50-ohm cable and terminator. Adjust VC1 *1 MHz* T-5795 for a frequency of 1.00 MHz.

## 11. 100 kHz Adjustment

Settings: **Mode:** CW, **Function:** Sine, **AM Mod:** Off, **DC Offset:** Off, **Amplitude:** Maximum, **Range:** 10k, **Dial:** 10, **Symmetry:** Off

Connect the LG 1311 to the frequency counter via 50-ohm cable and terminator. Adjust  VC2 *100 kHz* T-5795 for a frequency of 100.0 kHz.



## 12. 10 / 5 MHz Adjustment

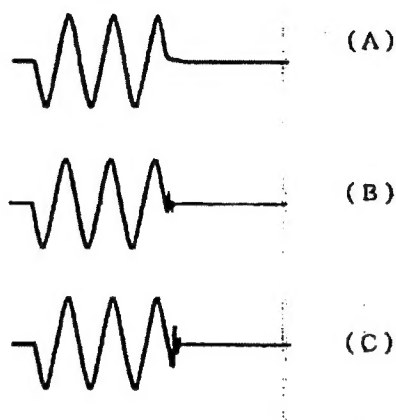
Settings: **Mode:** CW, **Function:** Sine, **AM Mod:** Off, **DC Offset:** Off, **Amplitude:** Maximum, **Range:** 1M, **Dial:** 10, **Symmetry:** Off

- Connect the LG 1311 to the frequency counter via 50-ohm cable and terminator.
- Adjust VC102 *10 MHz ADJ* T-5795 for a frequency of 10.00 MHz.
- Set the dial to 5 and adjust VC101 *5 MHz ADJ* for a frequency of 5.00 MHz.
- Repeat Step 12 as required.

## 13. Trigger Compensation

Settings: **Mode:** Trigger, **Function:** Sine, **AM Mod:** Off, **DC Offset:** Off, **Amplitude:** Maximum, **Range:** 100k, **Dial:** 1, **Symmetry:** Off

- Apply a 100 kHz TTL signal to the LG 1311 rear panel *TRIG IN* connector and the channel 2 input of the oscilloscope.
- Connect the LG 1311 to the channel 1 input of the oscilloscope via 50-ohm cable and terminator.
- Sync the oscilloscope on channel 2, and adjust the oscilloscope and the LG 1311 *Frequency Dial* so several cycles of the wave form are displayed on the oscilloscope.
- Adjust VC103 *GATE ADJ* T-5795 for a minimal ripple at the trailing edge of the sine wave as shown below.



## 14. Distortion Adjustment

Settings: **Mode:** CW, **Function:** Sine, **AM Mod:** Off, **DC Offset:** Off, **Amplitude:** Maximum, **Range:** 1k, **Dial:** 10, **Symmetry:** Off

Connect the LG 1311 to the distortion meter via 50-ohm cable and terminator. Adjust VR501 *+DIST ADJ* and VR502 *-DIST ADJ* T-5795 for a minimum distortion reading. The reading should be 0.04% or less.

## 15. AM Modulation Adjustment

Settings: **Mode:** CW, **Function:** Sine, **AM Mod:** On, **DC Offset:** Off, **Amplitude:** Maximum, **Range:** 10k, **Dial:** 10, **Symmetry:** Off

- Connect the LG 1311 to the CH-2 input of the oscilloscope via 50-ohm cable and terminator.
- Connect a 1 kHz 0.5 Vrms sine wave to the *MOD IN* connector of the LG 1311 and the CH-1 input of the oscilloscope.
- Set the oscilloscope to display CH-2, Sync on CH-1, with the time base about 0.2 msec. Adjust the oscilloscope to display the modulated waveform.
- Set the LG 1311 *MOD* level fully counter clockwise.
- Set the *CARRIER LEVEL* for a minimal level (a flat line) as displayed on the oscilloscope. Adjust VR203 *AM DC OFFSET* T-5795 for a DC level of zero volts as displayed on the oscilloscope.
- Set the LG 1311 *CARRIER LEVEL* fully clockwise.
- Adjust VR201 *CARRIER LEVEL* T-5795 or the positive and negative peaks of the modulation envelope to be equal in amplitude.

## 16. Sweep

Settings: **Mode:** SWEEP, **Sweep/Burst Time:** 1-100ms, **Sweep Variable:** fully counter clockwise, **Sweep /Start Frequency:** Sweep, **Function:** Sine, **AM Mod:** Off, **DC Offset:** Off, **Amplitude:** Maximum, **Range:** 100k, **Dial:** 10, **Symmetry:** Off

- Connect the oscilloscope to TP201 T-5796 and adjust VR200 *SWEEP OFFSET ADJ* T-5796 for a DC offset of zero volts as displayed on the oscilloscope.
- Connect the oscilloscope to TP200 T-5796 and note the negative peak voltage.
- Connect the oscilloscope to TP202 T-5796 and adjust VR202 *BOTTOM ADJ* T-5796 for the same negative peak voltage as noted above. Adjust VR201 *TOP ADJ* T-5796 for the positive peak voltage of zero volts.

## 17. High Frequency Compensation

Settings: **Mode:** SWEEP, **Sweep/Burst Time:** 1-100ms, **Sweep Variable:** fully counter clockwise, **Sweep /Start Frequency:** Sweep, **Sweep Frequency:** fully counter clockwise, **Lin / Log:** Lin, **Function:** Sine, **AM Mod:** Off,

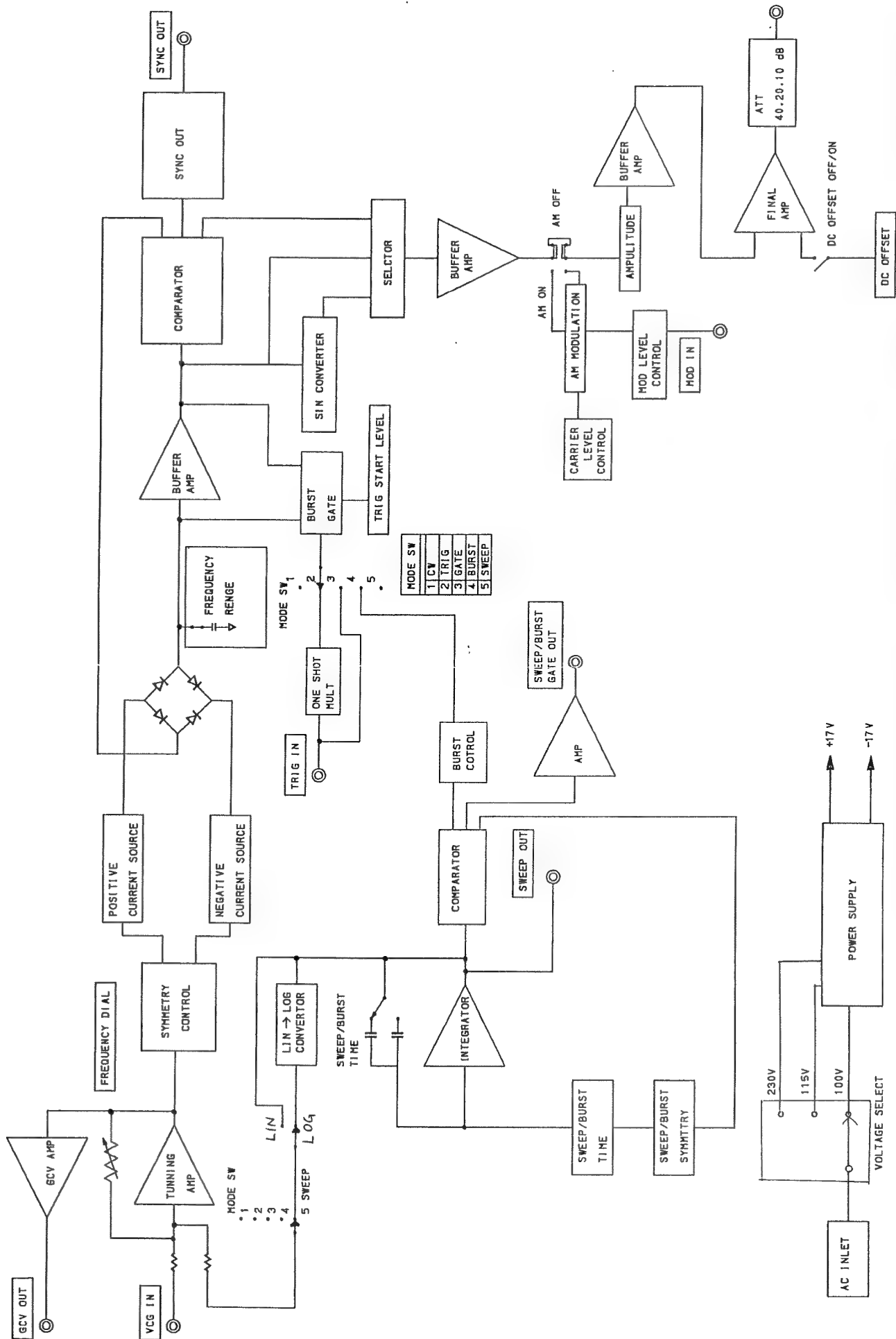
**DC Offset:** Off, **Amplitude:** Maximum, **Range:** 1M, **Dial:** 10, **Symmetry:** Off

- Connect the LG 1311 to the oscilloscope via 50-ohm cable and terminator. Sync the oscilloscope to the LG 1311 *SWEEP/BURST GATE OUT* rear panel connector. Adjust the oscilloscope to view one sweep cycle. Adjust VC501 *HF ADJ* T-5795 for best flatness.
- Set the LG 1311 **Function** to Triangle wave and adjust VR601 and VC601 *HF ADJ* T-5795 for best flatness.
- Set the LG 1311 **Function** to Square wave and adjust VR101 and VC104 *HF ADJ* T-5795 for best flatness.

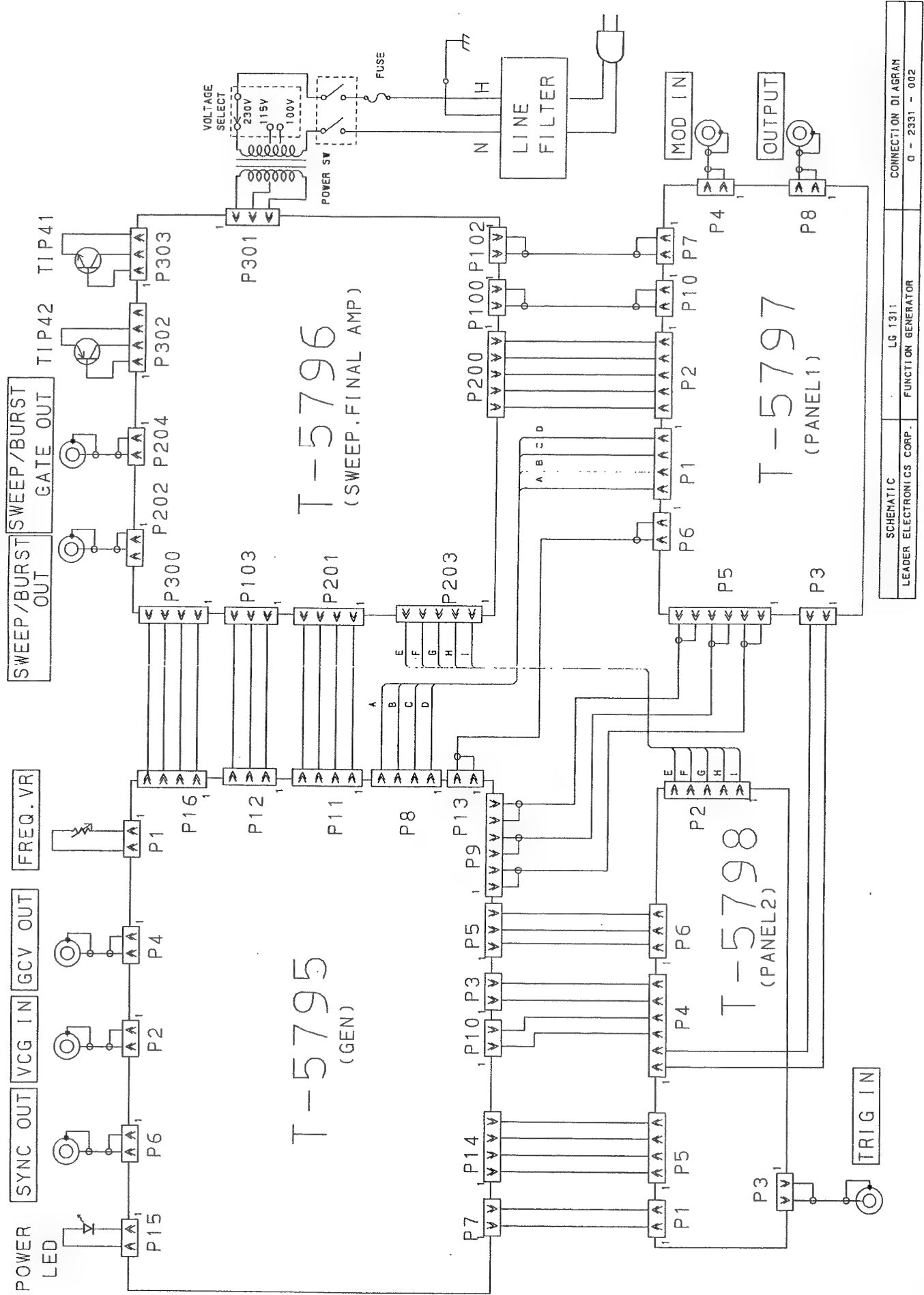
## 18. Impedance Check

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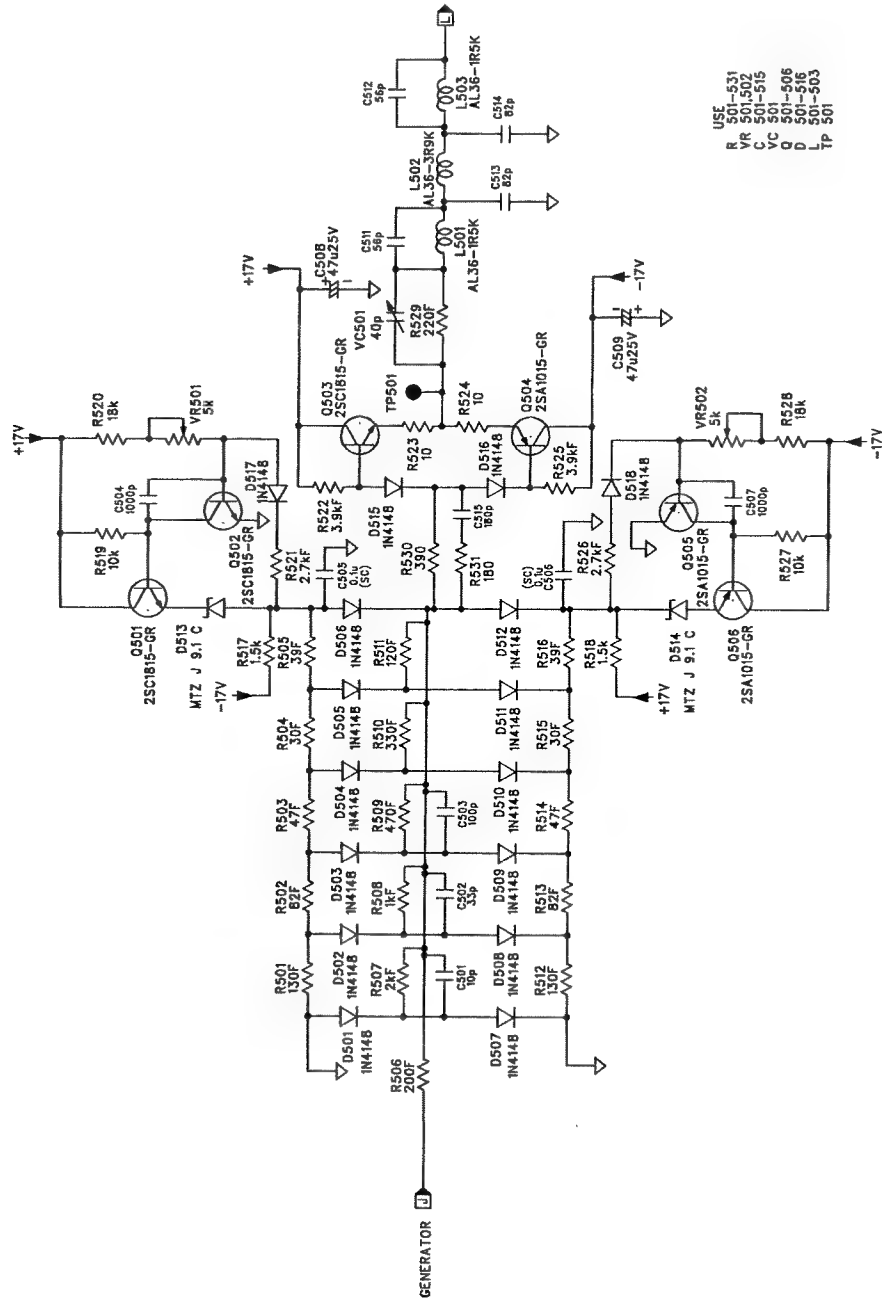
- Connect the LG 1311 to the oscilloscope via 50-ohm cable *without a terminator* and adjust the amplitude for an 8 division peak to peak display.
- Insert the 50 ohm terminator ( 75-ohms with the option ) into the circuit at the oscilloscope input.
- The oscilloscope amplitude should be 4 divisions peak to peak.



SCHEMATIC	LG 1311	Block DIAGRAM
LEADER ELECTRONICS CORP.	FUNCTION GENERATOR	0 - 2331 - 001







T-5795

SCHEMATIC  
LEADER ELECTRONICS CORP.

LC1311

FUNCTION GENERATOR

SIN

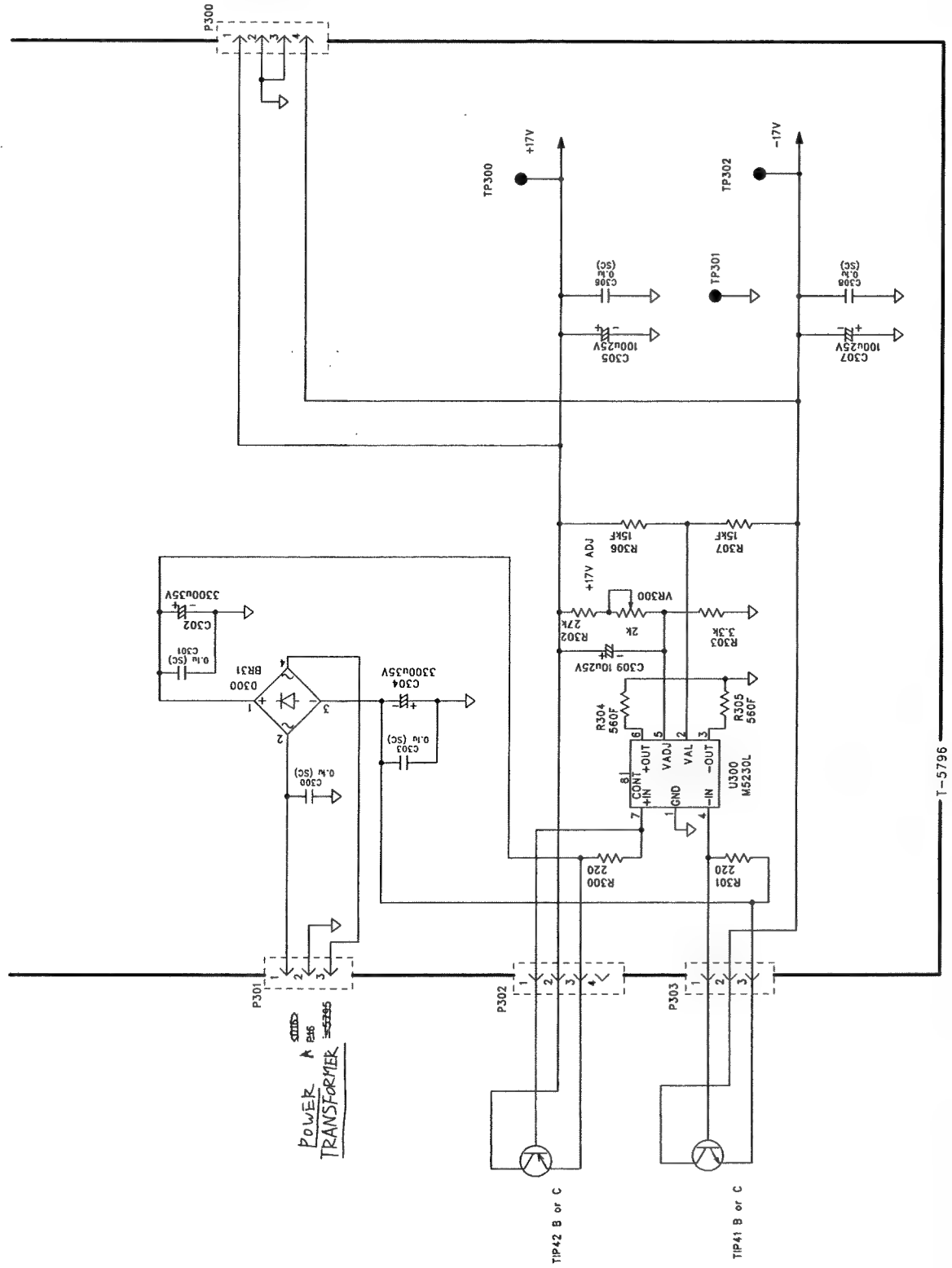
O-2331-014

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

- USE  
 R 300-307  
 VR 300-308  
 U 300-309  
 D 300-310  
 P 300-311  
 TP 300-312

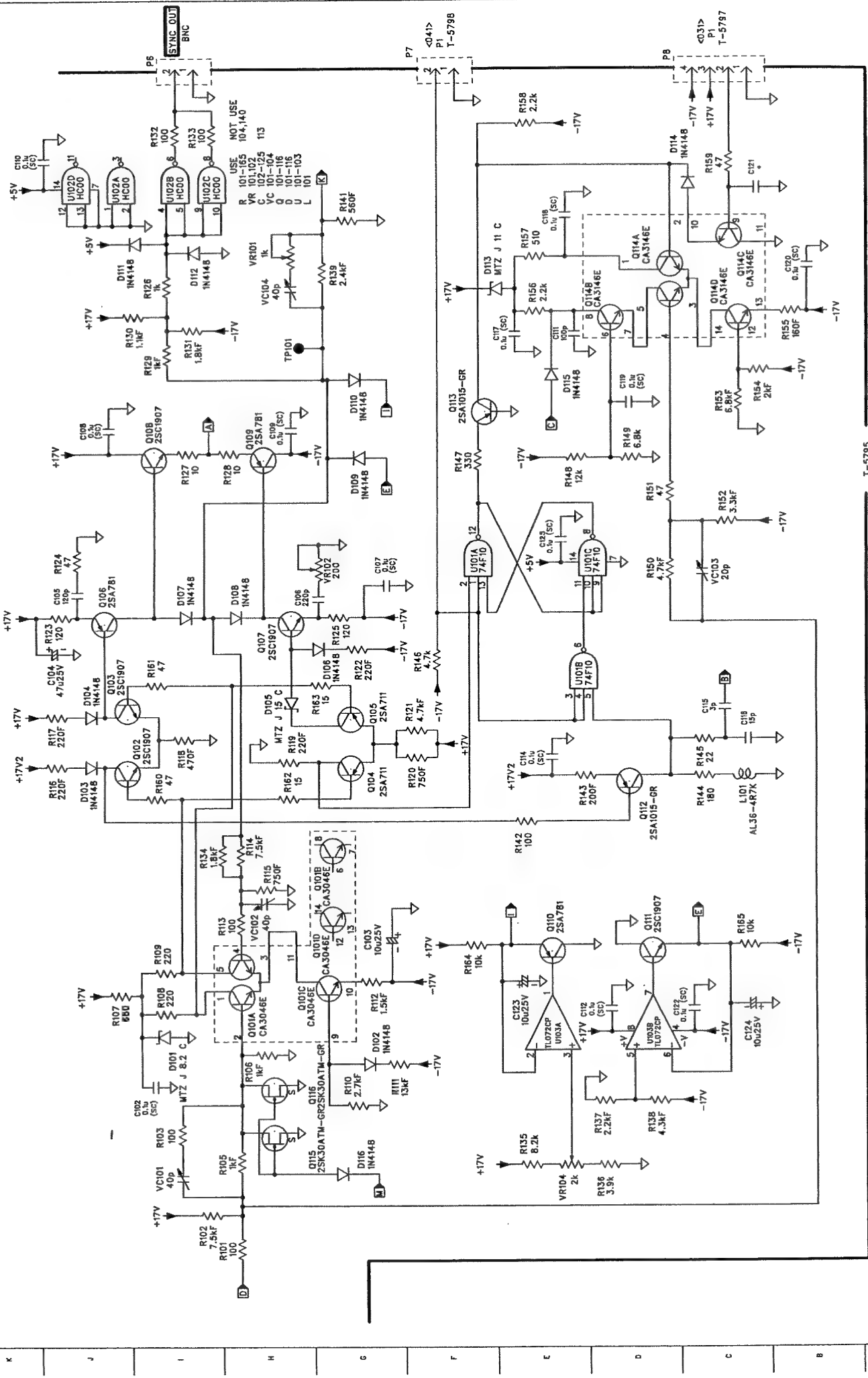
POWER  
 TRANSFORMER

0167 P16 T-5795 A

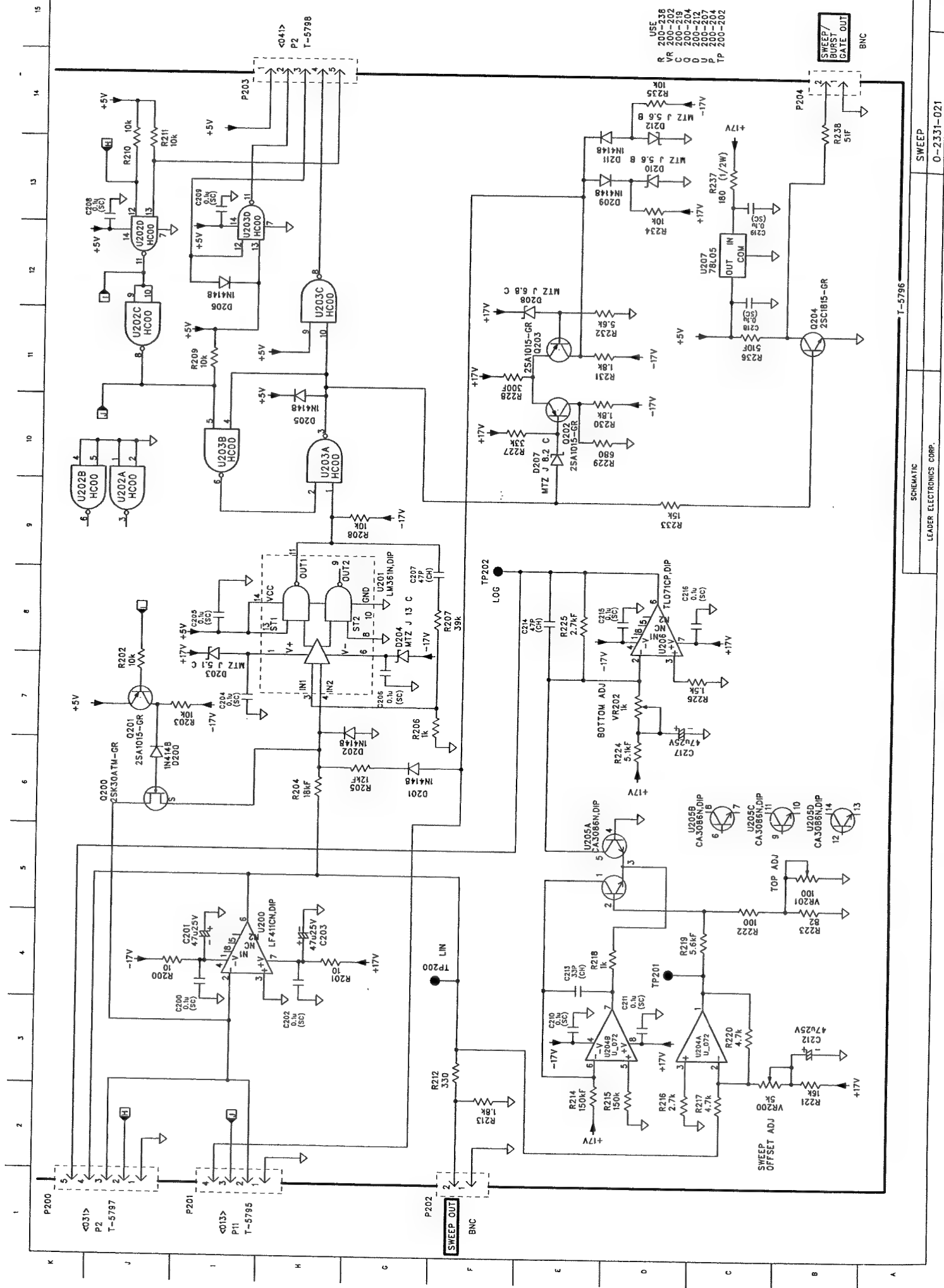


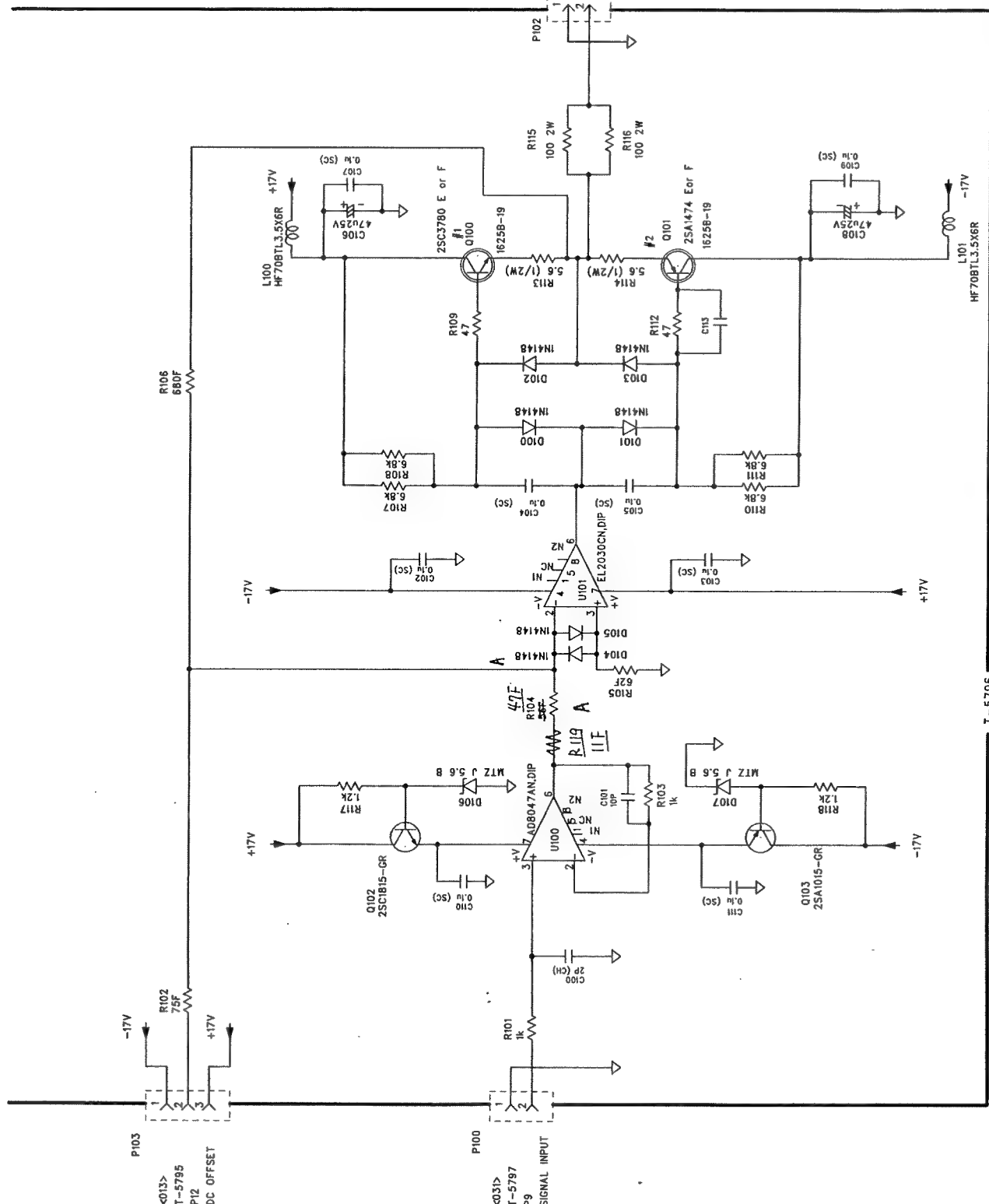






SCHEMATIC	LG1311	FUNCTION GENERATOR	COMPARATOR BURST SYNC
LEADER ELECTRONICS CORP.			O-2331-012





USE  
 R 100-119  
 C 100-113  
 D 100-103  
 Q 100-107  
 U 100-101  
 P 100-103

NOT USE  
 A  
 C 113

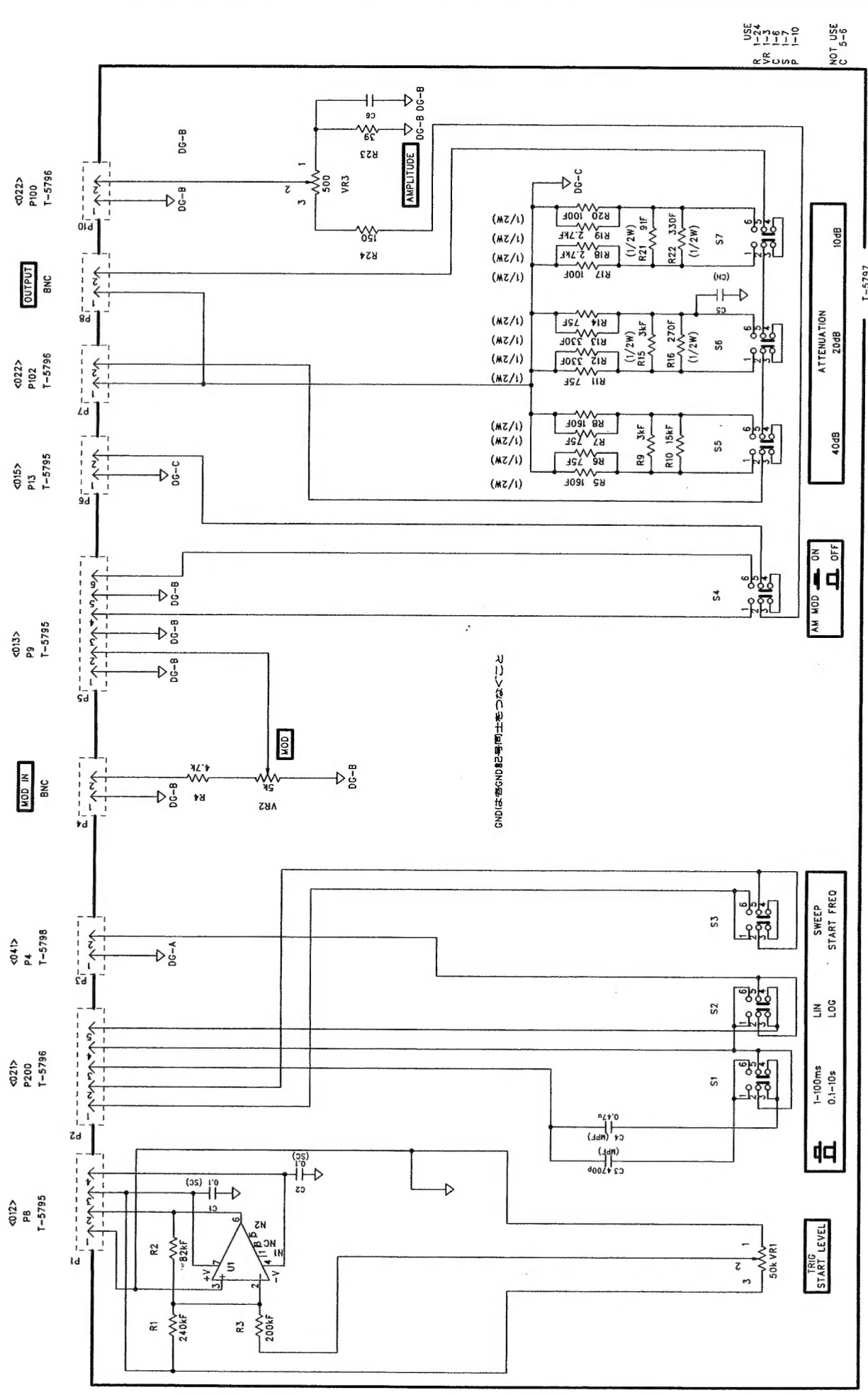
T-5796

SCHEMATIC  
 LEADER ELECTRONICS CORP.

FINAL AMP  
 O-2331-022A

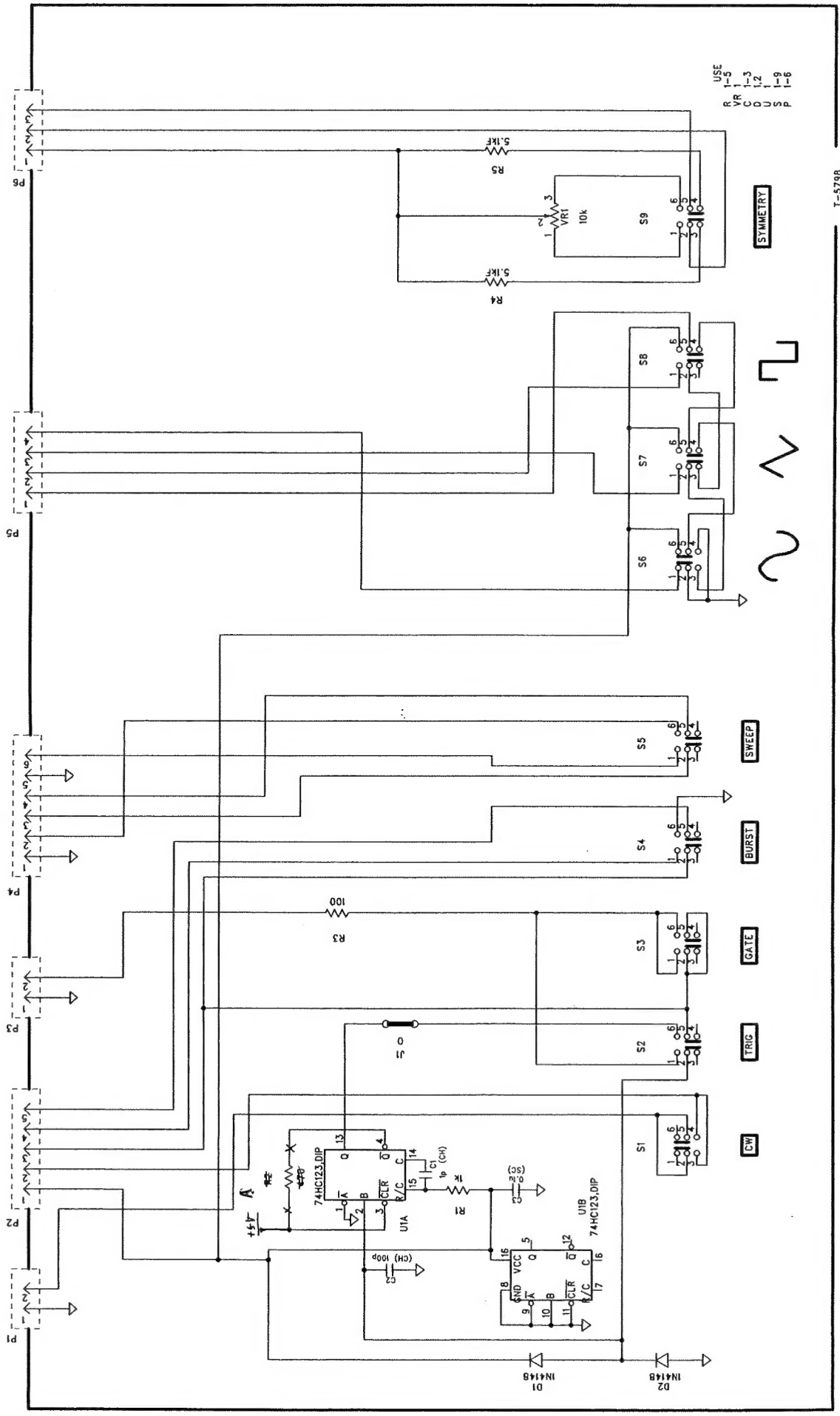






1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

<012> P7 T-5795  
 <021> P203 T-5796  
 TRIG IN BNC  
 <011> <013> <031> P3 P10 P3 T-5795 T-5795 T-5797  
 <015> P14 T-5795  
 <011> P5 T-5795



CW TRIG GATE BURST SWEEP

USE  
 R 1-5  
 VR 1-3  
 C 0 1-2  
 S 1-6

SYMMETRY

T-5798